



Back to a base

Concepts for a lunar base are discussed in excerpts from a new Advanced Programs Office report. Story on Page 3.



Good prospects

A group of local engineers and scientists are working on a private unmanned Lunar Propector mission. Story on Page 4.

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Craig task group will detail Mars steps

By Kelly Humphries

A task group of NASA and contractor experts will begin a detailed examination this month at JSC of the missions, vehicles and technologies needed to meet President Bush's new lunar and Mars exploration goals.

The agencywide technical study group, under the direction of Frank Martin, associate administrator for exploration, will involve two phases. The first, a 90-day effort to provide immediate information to Vice President Dan Quayle and the National Space Council, will involve 80 to 85 people from JSC and other NASA centers. The second phase will be a longer effort to further define the vehicles, equipment and technologies needed with an eye toward procurement.

Mark Craig, manager of the Lunar and Mars Exploration Office, will direct the task group's efforts at JSC.



Mark K. Craig

from his office at NASA Headquarters, where he is leading the agency's response to the President's exploration challenge.

"This is a long-term agencywide program," Cohen added. "What we are doing now is not just for JSC, although JSC will play an important part in it, but it is for the total agency."

Cohen said many of the concepts and technologies the task group will look at already have been looked at in detail. But this study will put together those separate studies in a more consolidated, succinct fashion.

In selecting the people for the task group, Cohen said, special care will be taken to choose those whose absence will not disturb the agency's ability to meet its space shuttle and space station commitments.

"Our number one job is still to fly the shuttle and fly it safely," he said.

Craig said NASA's assignment is to research the resources and timetable for making Space Station Freedom operational, establishing a lunar base, making robotic explorations

Please see **TASK**, Page 4



JSC Photo by Benny Benavides

Hurricane Chantal's deluge rains down on JSC Tuesday as her 75-mile-an-hour winds buffet trees and buildings. This photo shows the flooding near Bldg. 3. Note the nearly submerged campus bench at left.

Chantal leak report: 'too many to count'

By Linda Copley

Twice in as many months is a bit more often than Plant Engineering Division Chief Keith McQuary cares to put the center's hurricane drill training into practice, but so far this year, nature has had other ideas.

Having just finished repairing the 71 leaks found in 43 on-site buildings by tropical storm Allison on June 26, McQuary finds his crew scurrying to take care of the damage inflicted by hurricane Chantal's unwelcome visit last Tuesday.

"I consider the leak report for Chantal to be a TMTC," McQuary said. "Too many to count."

McQuary and his staff definitely noted differences between the two storms. "Allison was only a tropical storm, and all it brought was rain, which was spread out over a few days," he said. "Chantal, a category one hurricane, inflicted much more

damage to the center, since the wind was much stronger."

McQuary's self-made rain gauge recorded about 17 inches of rain at JSC over a two-day period during Allison. "According to my calculations, the total rainfall at the center from Chantal was over 15 inches of rain in less than 24 hours," he said.

The major roof damage was located in Bldgs. 49, 9B, 32 and 44. In those instances, the wind had pulled the fasteners loose from the roof, or actually peeled up the roof, according to Mechanical Operations Branch Chief Garlan Moreland's report.

"We were vacuuming water until 12:30 or 1:00 a.m. last night," McQuary said. McQuary estimated the damage and cleanup costs from Chantal will run into "several hundred thousand dollars. "On the

Please see **CHANTAL**, Page 4

Columbia sits ready on pad; prepared for launch Tuesday

By Kyle Herring

Final preparations are in work on Space Shuttle Columbia at Kennedy Space Center's launch complex 39B for its planned launch Tuesday on mission STS-28—a dedicated Department of Defense flight.

The crew for the mission, Commander Brewster Shaw, Pilot Dick

exists in any areas of the three liquid-fueled engines.

The orbiter's aerosurfaces were cycled Wednesday and preparations were under way to perform leak checks of seals around the engine valves. Later Wednesday, checks of the range safety system were conducted.

Workers continued closeout operations in the orbiter's aft engine compartment. Also this week, all ordnance was installed on the vehicle's SRBs and external tank. This work is always done in a "pad clear" mode meaning only essential personnel are allowed in the launch complex during this time.



A crew return ceremony is planned at Ellington Field about seven hours after Columbia lands at Edwards Air Force Base. All JSC employees and their families are invited to NASA Hangar 990. For landing and ceremony details, call the Employee Information Service, x36765.

Richards and missions specialists Dave Leestma, Jim Adamson and Mark Brown, is scheduled to arrive at the launch site aboard T-38 training aircraft tomorrow afternoon. The crew will make its final practice simulations in the Shuttle Mission Simulator with the flight control team in the Mission Control Center before departing JSC.

Once at Kennedy, Shaw and Richards will conduct practice flights in the Shuttle Training Aircraft making landing approaches to the Shuttle Land-

ing Facility just west of the launch pad where *Columbia*, attached to its solid rocket boosters and external tank, waits to make its first flight into space since January 1986 when it flew mission STS-61C.

Launch remains scheduled for Tuesday morning between 6:30 and 10:30 a.m. CDT. Actual launch time will not be revealed until the countdown picks up after the final planned hold at T-9 minutes.

Work this week included completion of the traditional frequency response test of the spacecraft main engine hydraulic actuators and valves Tuesday night. Also completed was the "blowdown" of the engine helium system to make sure no contamination

Sniff checks of the orbital maneuvering system fuel motor valves this week showed no system leaks and no residual fuel in the propellant lines.

Other launch countdown preparations were under way this week, including wash down of the mobile launch platform, flame trench and pad surface to ensure no debris exists that could damage the orbiter and stack during the initial engine ignition sequence.

Countdown for the mission is scheduled to begin at 11:01 p.m. CDT Friday.

If the schedule remains unchanged, Shuttle managers will travel to Kennedy on Sunday morning for the L-2 and L-1 day meetings to assess final readiness of *Columbia* for launch. Meanwhile, the movements of Hurricane Dean, located Thursday in the western Atlantic nearing Puerto Rico, were being tracked for possible effects on weather at the Cape.

Voyager finds more Neptune moons

Three newly discovered moons may shepherd ring arcs

The far-encounter phase of Voyager 2's appointment with the planet Neptune will not begin until Sunday, but information from the 12-year-old spacecraft already is yielding surprises. Images have revealed three additional new moons in orbit around Neptune, Voyager imaging team scientists announced Thursday.

The discovery brings to six the number of moons known to exist around the blue planet, including one, 1989 N1, discovered by Voyager 2 last month. The spacecraft, launched in 1977, has explored Jupiter, Saturn and Uranus and will come within 3,000 miles of Neptune on Thursday, Aug. 24.

The timing of events on that day

includes the closest approach to the moon Nereid at 3:12 p.m., JSC time, followed by an inbound crossing of a planetary ring-plane at 6:03, the closest approach to Neptune at 7 and the outbound ring-plane crossing at 8:29.

A few hours later the spacecraft will make its closest approach to Neptune's largest known moon, Triton, at 12:14 a.m., Aug. 25. Triton is roughly the size Earth's Moon, and is remarkable for being the only large moon in the solar system with a retrograde orbit (it travels in the direction opposite the planet's rotation). The moon completes one rotation on its axis every 5.88 days — the same amount of time Triton takes to circle Neptune. Therefore Triton always shows the

same face to Neptune, just as the Moon always displays the same hemisphere to Earth.

Finding so many moons when the spacecraft was more than 22 million miles away from Neptune may mean there are many more to be found in coming weeks, according to Voyager scientists.

The three newest Neptunian satellites, temporarily designated 1989 N2, 1989 N3 and 1989 N4, were tracked as candidate moons in images returned by the spacecraft over a 5-day period. When the objects were found to follow predicted orbits, Voyager imaging scientists were able to confirm them as moons of the planet.

Please see **VOYAGER**, Page 4



JSC Photo

TRAINING FOR TASTE—Members of the STS-28 crew test their expertise with the shuttle's culinary tools during a training session in the Crew Compartment Trainer. From left are Brewster Shaw, Mark Brown, Jim Adamson, Dick Richards and Dave Leestma.

JSC

Ticket Window

The following discount tickets are available for purchase in the Bldg. 11 Exchange Gift Store from 10 a.m. to 2 p.m. weekdays. A calendar of Employee Activities Association events is now available on the PROFS computer network.

General Cinema (valid for one year): \$3.50 each.

AMC Theater (valid until May 1990): \$3 each.

Sea-Arama Marineworld (Galveston, valid until Aug. 17, 1990): adults, \$8.15; children \$5.10.

Sea World (San Antonio, year long): adults, \$17.25; children \$14.75.

Palm Beach at Moody Gardens (valid until September 1989): adults \$2.75; children \$1.50.

Astroworld (valid 1989): adults, \$14.12; children under 4, \$11.99; season pass, \$32.36; Waterworld (valid 1989): \$8.15.

Astros vs. Chicago Cubs (August 19, 7:35 p.m.): \$9.

Texas Renaissance Festival (Open every weekend from September 30 through November 12): adults, \$8.95; children \$4.95.

JSC

Gilruth Center News

Sign up policy—All classes and athletic activities are first come, first served. To enroll, you must sign up in person at the Gilruth. Everyone will be required to show a badge or EAA membership card. Payment must be made in full at the time of registration. Classes tend to fill up four weeks in advance.

EAA badges—Dependents and spouses may apply for a picture I.D. 6:30-9:30 p.m. Monday-Friday.

Defensive driving—Course is offered from 8 a.m.-5 p.m., Aug. 19; cost is \$15.

Weight safety—Required for use of the Rec Center weight room. Classes will be 8-9:30 p.m. on August 9 and 24; cost is \$4.

Aerobics and exercise—Both classes are ongoing; cost is \$24.

Mixed Volleyball Sign-ups—Registration will be held the week of August 21. This season the actual picking of teams to play in the league will be done by a LOTTERY system. For more information, come by and pick up a flyer on the guidelines and procedures.

Fall Basketball Sign-ups—Registration for Basketball leagues will be held the week of August 14. As in previous seasons, NASA badged teams will sign up first.

JSC

Swap Shop

Swap Shop ads are accepted from current and retired NASA civil service employees and on-site contractor employees. Each ad must be submitted on a separate full-sized, revised JSC Form 1452. Deadline is 5 p.m. every Friday, two weeks before the desired date of publication. Send ads to Roundup Swap Shop, Code AP3, or deliver them to the deposit box outside Rm. 147 in Bldg. 2.

Property

Rent: Beach cabin, Crystal Beach, sleeps 7, A/C, \$200/dep., \$325/wk. (409) 832-2582 or (409) 755-1638.

Sale: 60 acres, 3 mi. from Karnes City, TX, on Hwy. 80; El Campo, TX, big 2-story house, on 1 1/2 lots, many fruit trees. 783-9164.

Sale: Taylor Lake Estates, 90' x 135' lot, \$36,500. Don, x38039 or 333-3313.

Rent: Clear Lake, Middlebrook II, 3-2-2, fenced, gar. opener, FPL, no pets, \$800 plus dep. 480-3260.

Rent: 2 BR apt., Webster/CL area, \$360/mo. Dave, x38156 or 486-5181 or Eric, x38420.

Lease: Forest Bend, 3-2-2, \$565, avail. Aug. 1. 996-9416.

Lease: Univ. Green patio home, 3-2-2, fans, gar. opener, avail. Sept. 1. \$700/mo., \$700 dep., ref. 486-8551.

Lease: Pebblebrook condo, 1 BR, W/D, fans, pool, tennis, no pets, \$325/mo. plus \$200 dep. Aggie, 280-1989 or Chris, 282-2667 or (409) 925-8593.

Rent: El Lago, 4-2, lg. fenced lot, avail. Sept. '89, \$895/mo. 532-4237.

Sale: Friendswood/Sun Meadow Estates, wooded lot, bordered by stream & golf course on 2 sides, approx. 245' deep and up to 86' wide, util. on site, \$29,500. Doug, x32860 or 486-7412.

Lease: 5 min. from NASA, 3-2 cottage, renovated, CH and A/C, dishwasher, fenced yard, shade trees. 728-5693.

Sale: Seabrook waterfront lot, lg. 100' x 125' on sm. bay, built up, owner fin. 474-5558.

Rent: League City, Pecan Forest subdiv., 3-2-2, FPL, \$700/mo. 554-6200.

Sale: Seabrook, 3 mi. from NASA, 3.29 acres w/sm. home, 2-1, \$95,000, owner fin w/\$25,000 down. 532-4784.

Sale: League City 2.06 acres, city water and sewer avail., near schools, 15 min. from NASA, \$39,950, owner fin. avail. 554-6695.

Lease: Reston, VA, architect-designed Hickory Cluster end-unit townhouse, 3-1.5, util. room, 1CCP, avail. 9/1, 9 mo. at \$850, 1 yr. at \$825, plus util., ref., non smoker(s), no pets. (713) 280-9488.

Sale: NE Dallas, TX, 2,100 sq. ft. townhouse, 3-3, study, closets, WBFP, fenced backyard, formal DR, \$94,500, FHA assum. w/qualif., will hold 2nd w/10% down. (713) 280-9488.

Sale: Timeshare, sleeps 2, Texas Hill Country (Canyon Lake, TX), 10/28-11/4/89, \$210. 280-9488.

Sale: Alvin/Pearland, brick 3-2-2 w/workshop area, 1,800 sq. ft., FPL, C/AH, 3/4 acre, trees, fenced by kennel, patio, beamed cath.

ceiling, \$53,000. 977-0223.

Sale: '85 35' Mallard motor home, loaded, low mi., \$40,000. 337-4051.

Rent: Glen Cove, League City, 4-2-2A, tri-level, FPL, fans, W/D, refrig., fenced, CA/H, boat ramp, \$650/mo., \$600 dep., no pets. 337-4051.

Sale: League City, The Landing, 3-1.5-1.5, oversize, landscaped yard, shade trees, lg. den, assum. loan, 10 1/2% fixed, low equity, \$59,900. 280-2285 or 332-2358.

Rent: Lake Livingston, waterfront, 3-2, fully furn., covered decks, pier, weekend or weekly. 482-1582.

Sale: 3-1-1, brown brick house, Alvin area, 25 min. from NASA, 2 blks. from high school. Kay, x32251 or 331-3379.

Cars & Trucks

'81 Mustang, A/C, P/S, cruise, runs great, \$1,900. x32283 or 489-9401.

'76 Plymouth Arrow hatchback, A/C, auto., \$600 cash, OBO. x34270 or 337-2682.

'74 Alpha Romeo GTV 2000, motor recently rebuilt, 5-spd., radials, BO. 334-0532.

'79 Toyota Celica GT, liftback, good cond., A/C, heater, new tires, new batt., Sony radio/cass., \$1,300, OBO. x37990, x33185 or 996-8608.

'68 Camaro Rally Sport, runs great, orig., \$2,100. 486-0421.

'86 Chevy Spectrum, A/C, great cond., good gas mi., \$3,400. Eddie Paddock, 280-1500 or 280-8532.

'67 Mustang, ex. cond., rebuilt eng., 6 cyl./200, auto., A/C, new tires, \$3,800. x36276 or 332-2869.

'81 Ford PU, dk. blue. Craig, 328-2679.

'85 Nissan, 48K mi., A/C, heat, radio, \$4,000 firm. 946-4104.

'88 Chevy Corsica, V-6, all power, dk. gray, w/tint, 15K mi., \$10,358. 282-6716 or 280-9479.

'80 Pontiac Phoenix, auto., 4 cyl., rebuilt eng., 20K mi., fair cond., \$1,200. (409) 925-6403.

'85 Dodge Charger, 2.2 eng., 5-spd., A/C, \$3,200. Laura, x36665 or 333-9733.

'70 Maverick, black, 2-dr., no rust, \$300. 280-0326.

'85 Pontiac 6000LE, ex. cond., anti-theft system, \$4,950. x30353 or 486-6605.

'79 Honda Civic, 4-spd., new tires, exhaust system, clutch, struts, CV joints, rebuilt eng., \$1,295. x33617 or 896-6347.

'87 Toyota Supra, white w/maroon int., ex. cond., 5 yr. unlimited mi. warr. x37898 or 333-2751.

'78 Pinto, 90K mi., \$300. 534-3167.

'67 Ford 3/4 ton PU, chrome rear step bumper. 332-4813.

'87 Volvo 240 DL, 5-spd., 24k mi., AM/FM cass., \$12,900. Terri, 333-7229 or 482-6294.

'84 Chevy Celebrity, metallic brown, 4-dr., auto., A/C, P/windows and locks, cruise, tilt-wheel, deluxe upholstery/seats, \$5,500. Edward, x36250 or 481-4889.

'76 Buick LeSabre, 350 c.i.d., new A/C, tires, radiator, trans., brakes, cruise, inter. wipers, 40 W-4 speaker stereo, \$600. Bill, x30164.

Today

Cafeteria menu—Special: fried chicken. Entrees: fried shrimp, baked fish, beef stroganoff. Soup: seafood gumbo. Vegetables: okra and tomatoes, buttered broccoli, carrots in cream sauce.

Monday

Cafeteria menu—Special: meat sauce and spaghetti. Entrees: franks and sauerkraut, sweet and sour pork chop with fried rice, potato baked chicken. Soup: cream of potato. Vegetables: French beans, buttered squash, lima beans.

Tuesday

Cafeteria menu—Special: smothered steak with dressing. Entrees: beef stew, liver and onions, shrimp Creole. Soup: navy bean soup. Vegetables: buttered corn, rice, cabbage, peas.

Wednesday

Cafeteria menu—Special: salmon croquette. Entrees: roast beef, baked perch, chicken pan pie. Soup: seafood gumbo. Vegetables: mustard greens, Italian green beans, sliced beets.

PSI meeting features guest speaker—The monthly meeting of the Clear Lake/NASA area chapter of Professional Secretaries, International (PSI) will feature syndicated newspaper columnist and seminar leader Peggy Morrow as the guest speaker on Wednesday, August 9. The social/dinner will begin at the Holiday Inn, NASA Road 1 ballroom at 5:30 p.m., followed by the program at 7. Ms. Morrow's presentation will sum-

marize her seminar on "Elements on Professionalism." Dinner tickets are \$9; contact Mary Todd, 282-3942, for reservations.

Thursday

UHCL Alumni to meet—The University of Houston-Clear Lake (UHCL) Alumni Association will hold a luncheon from 11:30 a.m. to 1 p.m. August 10 at the Gilruth Center. Reservations are due by noon August 7. Deans and faculty will be present to answer questions and to discuss UHCL's role as America's Space University. For more information and reservations, please call 488-9222 or 486-5250.

Cafeteria menu—Special: stuffed cabbage. Entrees: beef tacos, ham and lima beans. Soup: beef and barley. Vegetables: ranch beans, Brussels sprouts, cream style corn.

August 11

Cafeteria menu—Special: Salisbury steak. Entrees: fried shrimp, deviled crabs, ham steak. Soup: seafood gumbo. Vegetables: buttered carrots, green beans, June peas.

August 14

Fall Basketball Registration—Registration for Basketball leagues will be held the week of August 14. As in previous seasons, NASA badged teams will sign up first. For more information call x35789 or x30304.

August 16

Toastmasters to meet—The next meeting of the Spaceland Club of Toastmasters International will

be from 7:15-8:15 a.m. August 16 in the Building 3 Cafeteria. Visitors are welcome. Contact Liz Duffy-Towner at x31543 for more information.

August 22

BAPCO to meet—BAPCO (Bay Area PC Organization), a PC users' group, will meet at 7:30 p.m. August 22 at the League City Bank & Trust. For additional information, contact Earl Rubenstein at x34807, or 326-2354; or Ron Waldbillig at 337-5074.

September 20

Computer security expo—The Data Processing Systems Division (DPSD) will host a User Workstation Security Exposition Sept. 20-21 in the Product Demonstration Facility (PDF), Bldg. 12, Rm. 112. Exhibitors will display anti-viral, file encryption, data storage, access control, keystroke auditing and Local Area Network security products. For more information, call the PDF at x37572.

Fall 1989

Aerospace Perspectives Course—A seminar entitled Aerospace Perspectives, HIST 5931, will be offered at the University of Houston-Clear Lake this fall. The course will take a non-technical but comprehensive look at the impact of aviation and space flight on modern society. The seminar will include brief lectures, with emphasis on class discussion and class reports. Each student will be required to complete a 20-25 page research paper. For more information, contact Roger Bilstein, 488-9678.

Boats & Planes

14' laser racing sailboat, good cond., galv. trailer incl., \$950. 713-486-8185.

14' V-bottom alum. fishing boat w/trailer, trolling motor, Chrysler Sea King 15hp eng., \$1,300. Jana, x31653 or 532-3008.

'77 Cobia Sea Scout, 16' center console, 70hp, galv. trailer, good cond., \$1,900. Joe, x31057 or 488-3866.

'81 Galaxy 17' Bowrider 120, OMC I/O, galv. trailer, ex. cond., \$4,000. 538-1221.

'67 Correct Craft, 18', inboard eng. w/very low hours, good cond., trailer incl., \$3,000. 282-2810 or 480-3909.

1.2hp Gamefisher O/B motor, 2 yrs. old, has cover, \$100; 13' Capri Cyclone sailboat w/trailer, new awlgrip paint, \$700. 334-1815.

Hobie 16', includes multi-colored sails, custom sail box, galv. trailer, many extras, like new, \$2,500 firm. 538-1148.

Cycles

'80 CB 750 custom Honda, good cond., \$1,050 cash. x34270 or 337-2682.

'82 Honda Nighthawk 650, good cond., 11K mi., \$1,075 cash, OBO. Kelvin, x36905 or 488-8173.

23' Nishiki Cresta touring bicycle, blue, '84 model w/rear rack and water bottle cage, ex. cond., \$250. Andy, 532-1723.

'80 Honda CB 750, new back tire and inspection, runs great, \$1,000, OBO., will trade for sm. car. 332-7501.

Audiovisual & Computers

Commodore 64 w/1541 disk drive, \$200. Robert, x33742 or 554-6631.

Household

2 sofas, \$300 ea.; solid oak dining table, \$800, OBO w/2 leaves plus 4 chairs; master suite BR furn., and more. Leslie, 480-5770.

Girl's BR furn., lt. yellow/white trim; twin beds, headboards, matt./box springs, 2 dressers, desk, nightstand; matching sheets, bedspreads, curtains all incl., ex. cond., \$700. Clay, x38133 or Leslie, 280-0479.

Entertainment center, lt. oak finish, holds T.V., stereo, VCR, and access., 77"H/55"Wx21"D, \$250. Jim, x32426.

26" Zenith console T.V., ex. cond., walnut trad., \$150, OBO. 481-0928.

Leather-look vinyl sofa, 7', good cond., \$125. x34847 or 486-4548.

Queen Anne style antique loveseat, cherry w/yellow velvet upholstery, \$300; Eastlake antique chair, \$75, OBO. Richard, x31440 or 332-2381.

25" Zenith color console T.V., great cond., \$200. Alzena, 280-7635 or 996-9033.

Ward's upright freezer, 10.1 cu. ft. almond, runs perf., \$150. Ron K., x34713 or 333-2273.

Antique golden bird's eye maple claw foot dresser w/oval beveled mirror, \$250; English wool area rug, \$40. Rudy, x37148 or 482-5181.

Couch, Early Amer., brown tone, \$150; recliner/rocker, brown plaid, \$75. Ed, x36250. 2 Bedsit foam chair cushions, brick red color,

locking tops, coord. throw pillows, \$55/pr. 280-9488.

BR set, dresser w/mirror/shelf unit, queen/dbl. bedframe, dk. pine, ex. cond., \$250. Bob, x32193 or 332-3817.

Large glass table w/4 chairs, ex. cond., \$140. x32251.

Queen size sleeper couch, \$150; twin size bed frame and box spring, \$25. Al, 283-6909 or 996-0501.

Waterbed w/oak mirrored headboard, 8 drawers, new heater, \$150. 992-1226.

Moving sale, have many household items, waterbed frame, heater, matt., queen size, \$100; J.C. Penney microwave, lg. \$100; misc. baby items; 2 ea. counter high stools, brown covers and chrome, \$15/ea.; book shelves, \$10/ea.; many smaller items. 333-9173.

Photographic

Olympus OM-2N black body w/1.4 lens, T32 flash, Winder II, power bounce grip w/cords, Soligar 28-80 w/macro, Vivitar series one 70-210 w/macro, all for \$900. Robert, x33742 or 554-6631.

Pets & Livestock

AKC reg. Cairn Terrier, 7 mo. old, female, had all shots, \$250. Mary Ann, x33518 or 534-4225.

Free black fem. kitten, 10 wks. old, wormed and all shots, playful, 333-6564 or 482-3824.

Wanted

Want VHS VCR, prefer on-screen program w/remote control. Patrick, x32635 or 488-1079.

Riders needed for van pool, West Loop park and Ride to NASA. Richard, x37557.

Want closeable barrel for feed, prefer oil can size. 947-8512.

Want rent house, good cond., CL area, couple, no pets, non smokers, need around Oct. 947-8512.

Want in-home child care for 2-mo. old infant, 20-25 hrs.wk., exp. w/infants required, 3 local ref. min. Susie, 480-8685.

Want, Aug.-Oct., ride from NASA to Pasadena. 472-5205.

Want old parachute, white pref., either buy cheap or borrow. Sequita, x39548 or 335-1895.

Musical Instruments

Kawai elec. organ, dual keyboard, rollout cover, solid oak, ex. cond., \$1,500. 332-9585.

Fender jazz bass guitar w/hardshell case, sunburst, was \$1,100, now \$595. x33617 or 892-6347.

Two trombones, Bach 42 w/F trigger, \$200; King Cleveland, \$100, both w/cases, access. Andy, 532-1723.

Student guitar (acoustic) w/case, new, \$100. 480-5132.

Peavy XR-800 8-channel stereo-powered mixing console, \$300; guitar (Squire Bullet by Fender) double cutaway style w/tremolo bar and rocktack distortion pedal, \$150; both items together, \$400. Billy, 338-2855.

Miscellaneous

New windows, doors, light fixtures and carpet remnants, priced cheap. Don, x38039 or 333-3313.

Through-the-wall electronic central air cleaner, cell size 28 7/8 x 23 5/16 x 6 inches deep, 2000 CFM, \$140. 480-0667.

Ruger 44 Super Blackhawk, 7 1/2", w/western style holster, ex. cond., \$350, OBO. 482-7607.

Epson elec. memory typewriter, (8KB - 32KB optional memory cards), was \$200, now \$130, OBO. Valerie, x38385.

Patrick Nagel commemorative prints, #7, #8, #11 through #15, \$200 to \$600. Mike, x32439 or 280-9005.

Lighted beer sign w/clock, \$20; 6 new ceiling fan motors and 3-4 misc. fan blades; all for \$30; undercounter cash drawer, good cond., \$20. 488-5564.

Oriental pattern 4' x 6' rug, \$25; set of four Bentwood antique chairs, \$100 set; port. Singer sewing machine, \$75; pr. of decorated wood shields, \$30, pr. 488-5564.

Dining table, solid oak w/6 cane bottomed chairs, \$750, OBO; office desk, steel, \$50, OBO; library-type steel book shelf, \$50, OBO. Patrick, x32635 or 488-1073.

Motorcycle helmets, Fulmer HT-90II dot, lg., \$75; bell shorty, \$20. Sam, x35602 or 482-9601.

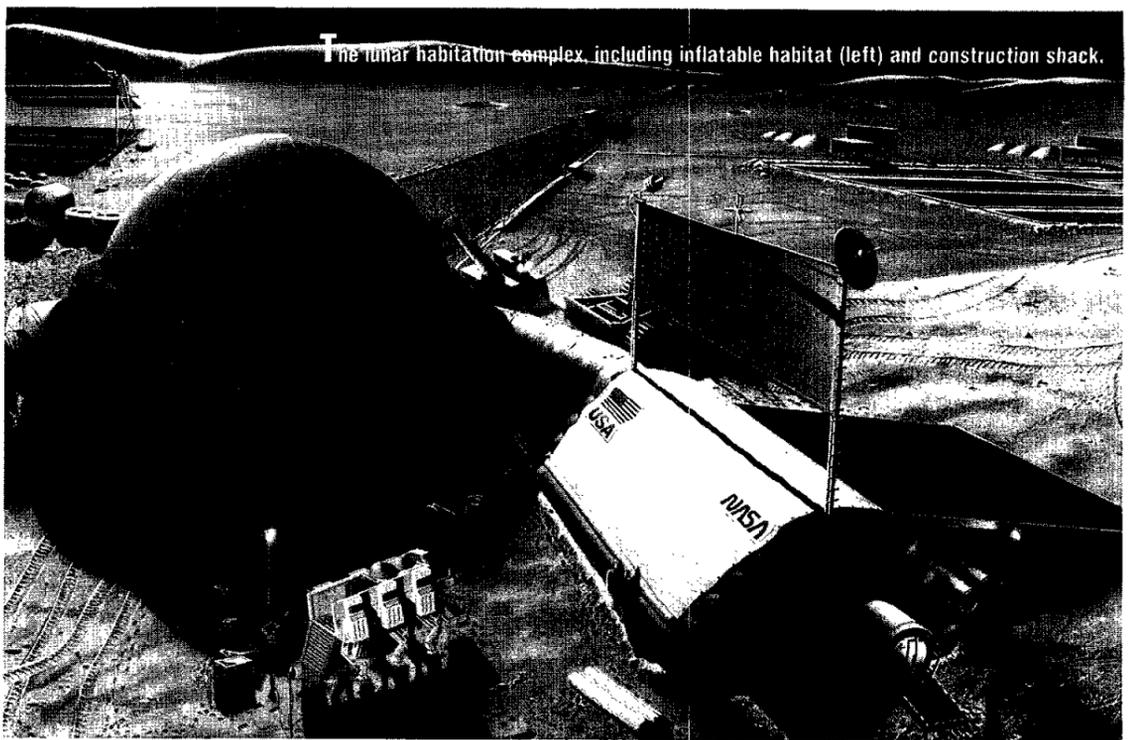
Four Bridgestone mags and P215705/R14 Kelly Starfire tires, half tread left, \$160. Mary, x35810 or Mack, 538-2061.

Bra-IROCZ, custom made, white w/black letters, like new, \$50. Sandy, 283-6947 or 486-8198.

LUNAR OUTPOST

P • A • R • T 2

THE HABITAT



The lunar habitat complex, including inflatable habitat (left) and construction shack.

A FOUR LEVEL INFLATABLE LUNAR HABITAT CURRENTLY IN PLANNING

[Editor's note: This is the second in a two-part series of excerpts from "Lunar Outpost," published by JSC's Advanced Programs Office, Systems Definition Branch in Engineering. The vehicles and structures discussed in this article represent just some of the concepts being considered, and are intended to challenge the reader to formulate new ideas and concepts. Part 1 appeared in the July 21 issue of Space News Roundup.]

The outpost, the forerunner to a permanently inhabited lunar base, is comprised of a landing site, habitat facility, and lunar oxygen pilot plant.

The landing site is located . . . north-northwest of the base, and the landing pads are aligned in a north-south orientation to accommodate descent of a lunar lander from the east. The landing site's distance from the outpost will minimize impacts from exhaust blast ejecta and chemical contamination from rocket plumes and will reduce the potential for damage if a crash or explosion should occur. The solar power field is particularly vulnerable to degradation from the byproducts of routine lunar landing operations.

The habitat provides living and working facilities for 12 crewmembers on the surface of the Moon. It is a pressurized, thermally controlled, and radiation-protected environment.

The oxygen pilot plant . . . could operate virtually autonomously, requiring only servicing and maintenance. The oxygen produced will be used to refuel the lunar landers and to supplement the outpost's oxygen supply.

Landing Pad

The landing facilities for an early lunar base will consist of little more than a flat area free of obstacles. Navigation beacons on the surface will guide the lunar landers, enabling unmanned landings.

A more advanced base may require improvements to the landing pad, such as a gravel surface to reduce the amount of dust raised by the lander's engines . . . Once routine two-way travel begins between the surface and lunar orbit, service and refueling facilities may be required. The landing pad will evolve into a lunar port . . .

The Habitation Site

Selection of the specific site for the habitat will be based chiefly on convenience. If a suitable crater can be found . . . the base will be located there; otherwise an excavation will be required . . .

The vehicle maintenance facility, to be located southwest of the habitat, is an open-ended inflatable Quonset hut that will accommodate four surface transportation vehicles.

A solar power field will be located northeast of the habitat to allow an unobstructed view of the Sun and to separate the solar arrays from dust raised by surface vehicles.

The lunar oxygen (LOX) pilot plant is located to the southwest of the habitat, removed from the solar power field and the radiators because it will generate dust.

The habitation complex consists of a construction shack, inflatable lunar habitat, lunar air lock, logistics interface module, environmental control and life support system (ECLSS) tanks, and radiation shielding . . .

The inflatable lunar habitat and construction shack are covered with a one-meter-thick layer of lunar regolith, a shield sufficient to reduce radiation from the largest recorded solar flares to safe levels.

The Lunar Construction Shack

The construction shack is a small mantended facility, a self-contained unit that can be set down on the surface and activated with minimum

effort. The first element of the lunar outpost to be erected, its primary function is to support lunar EVA for science and for lunar outpost construction.

In the early phases of lunar exploration, the astronauts can live out of the landing craft, as was done during Apollo. When the outpost becomes operational, larger crews staying for months at a time will live in a large habitation complex. The shack fills a functional gap between lunar landers and a permanent lunar outpost . . . Lander stay times will be on the order of a few days to a week . . .

Another role of the construction shack might be that of a scientific base camp. A number of shacks distributed across the lunar globe could support broad lunar exploration initiative.

The Inflatable Habitat

An inflatable lunar habitat will provide a living and working environment for a crew of 12. It is a 52 foot, six inch spherical envelope with four levels of living and working areas. A . . . vertical circulation shaft allows transfer of crew and equipment between levels. The crew will move vertically by using a ladder; equipment will be hoisted by a block and tackle system.

Structure. The inflatable habitat comprises two structural systems. The primary structure . . . is designed to withstand a pressure of 14.7 psia. It is a composite of high-strength multiply fabric with a non-permeable bladder inside and a thermal coating on the exterior.

The secondary structure is composed of a spherical rib-cage, core columns, radial floor beams, and a modular flooring system. The primary structure will bear the loads from pressurization, the secondary structure the loads created by the crew, furnishings, and equipment.

Deployment. Once the construction shack is activated and covered with regolith for radiation protection, building of the main habitation can begin. Working out of the shack, the crew will place the habitat in a depression (either pre-existing or a man-made crater), anchor it to the foundation, and inflate it . . .

A concave foundation used for anchoring and leveling the habitat is installed prior to habitat inflation by driving piles into the bottom of the crater. After the habitat is checked out . . . a pressurized tunnel is attached from the construction shack.

Air Lock. The purpose of a lunar air lock is to handle the transition of crew from intravehicular activity (IVA) to EVA and vice versa. Depending on the lunar suits used and the habitat pressure, a short oxygen pre-breathe may be required to clear nitrogen from the crewmember's body before leaving the habitat. The air lock can accommodate two crew members at one time.

The Power System

The early lunar outpost will need about 100 kilowatts of electricity to maintain the environment control system, power laboratory equipment, and provide energy for tools and vehicles outside.

The three most promising options for power generation are solar photovoltaic power system (which) . . . uses a semiconductor device to conduct sunlight directly into energy, . . . a solar dynamic power system (that) uses a thermodynamic cycle to convert the heat from concentrated sunlight into work, which is then converted to solar energy, and . . . a nuclear reactor (that) produces power through the fission of radioactive nuclei, releasing radiation and thermal energy.

Thermal Control

Thermal control of the lunar base is difficult due to the extreme environment on the Moon . . . Problems with the atmosphere, the lunar soil, and micrometeoroids all must be accounted for before an extended presence can be realized . . .

Two principal methods to maintain an even heat flux out of the habitat are to increase the radiating temperature as the lunar surface heats up or to shield the radiators so they can experience, or "see," a constant temperature . . .

The Moon is constantly being bombarded with micrometeorites, strikes of which against the radiating surface will reduce the efficiency of the radiator . . . A puncture by a micrometeorite will allow the liquid to evaporate, diminishing performance . . . Fortunately, the flux of micrometeorites is inversely proportional to their size: there are large numbers of tiny ones and very few of the relatively larger sizes.

Surface Transportation

Lunar surface transportation is designed to move people and equipment to accomplish local

objectives and perform long distance missions . . . Other construction tasks, such as excavation or large equipment assembly, will be accomplished by specially designed construction equipment . . .

The Moon has one-sixth the gravity of Earth, practically zero atmosphere, extreme temperature swings, and almost no magnetic field to provide protection from radiation . . . Two types of transportation vehicle will be required during the buildup phase of the lunar outpost: an unpressurized rover for local transportation, and a pressurized vehicle for long-range travel.

Construction And Assembly

Construction and assembly tasks required for the buildup of the lunar outpost, similar to those now accomplished with terrestrial equipment on Earth, can be grouped into five categories: erection, excavation, hand tool work, use of mechanical advantage devices, and large scale . . . transportation . . .

One of the most cumbersome excavation tasks required early in the outpost buildup will be the creation of a shield to protect humans from the harmful radiation and micrometeorites . . . that bombards the lunar surface.

Another task planned is the setup and operation of a small oxygen plant. Operation of this plant will require the excavation of lunar soil on a continuous basis.

Maintenance And Supply

Maintaining and supplying a lunar outpost is a complex and variable undertaking. In the early stages of occupation, the source of all spare parts and supplies will be either Space Station Freedom or Earth. The logistics alone could drive the design of the lunar transportation system . . .

The Oxygen Plant

The oxygen pilot plant facility, designed to prove the technologies necessary to produce oxygen on the surface of the Moon, is intended to test different concepts and determine which method produces oxygen most efficiently . . .

The complexity of a resources problem will mandate a high level of automation . . . The facility will provide the problem diagnosis, then humans will intervene to remove the faulty component and repair it. Should full automation be impractical, telebotonic operation . . . will be the second choice.

The oxygen production plants receive bulk lunar regolith from a nearby mining facility . . . The soil is scraped up, loaded on large soil movers, and transported to the production facility. Once the regolith is transported to the plant or plants, it must be concentrated to ensure a sufficient quantity of oxygen, found as a component of minerals in the soil, is present . . .

The Future

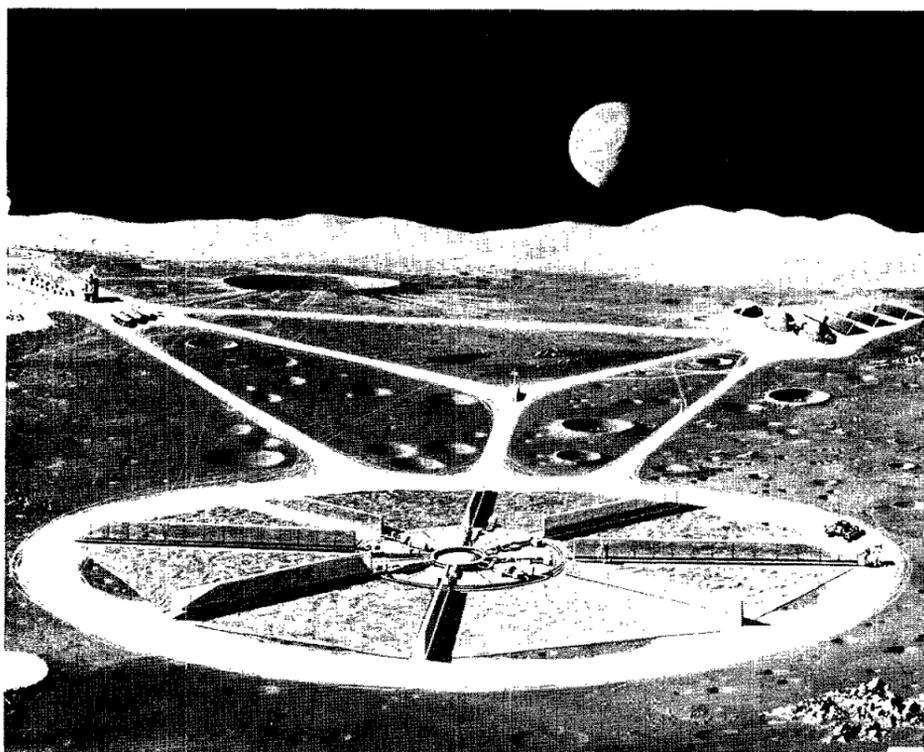
The technology for the habitation and transportation systems just described are within our grasp. Once a commitment is made to lunar development, the outpost could grow into a network of lunar bases and eventually evolve into a self-sufficient lunar colony . . .

The Moon is many things: a stepping stone into the solar system, a laboratory for exotic research, a source of natural resources, and possibly the birthplace of a new human civilization. The technology needed to start realizing this great potential is here. All that is required is the will to exercise it.

A multi-megawatt nuclear power plant, with radiating panels.

(Top) Illustration by Mike Stovall

(Bottom) NASA Illustration



NASA studying how vegetation influences weather

Scientists converge on Kansas prairie for surface climatology project

NASA scientists—joined by others from the U.S., Soviet Union, Canada, England and France—has set up camp this summer on a central Kansas prairie to learn how vegetation regulates the rate of soil moisture returned to the atmosphere, ultimately influencing local weather and regional climate.

In addition to land surface vegetation, scientists also expect to

learn more about the effects on climate of other land surface properties, such as soil moisture and regional hydrologic characteristics.

The NASA-managed effort—led by scientists from the Laboratory for Terrestrial Physics at Goddard Space Flight Center—is an element of the International Satellite Land Surface Climatology Project

(ISLSCP) and is known as FIFE, the first ISLSCP field experiment.

FIFE '89—with data from five Earth remote-sensing satellites, six research aircraft and dozens of high-tech surface and airborne measurement devices—is being conducted on and over a 9-by-9 square mile area in the Konza Prairie Natural Area, near Manhattan, Kan.

A period of intensive, simultaneous observations began July 23 and will continue until Aug. 12.

According to Dr. Forrest Hall, the FIFE science coordinator with Goddard's Earth Resources Branch, data from the ground, aircraft and satellite-generated observations are being placed in a computer data base at Goddard for access by all FIFE investigators.

One of the many users of the results generated by the project will be Dr. Piers Sellers of the University of Maryland, at College Park, the FIFE staff scientist. Instrumental in the design of FIFE, Sellers will combine computer models of vegetation with global weather to improve the understanding of how vegetation interacts with the atmospheric circulation.

New circuits could triple data capacity

Scientists at Lewis Research Center have established a new benchmark in the application of high-temperature superconductors to high-frequency electronic circuits.

They have produced the first electronic circuit able to operate at 33 to 37 Gigahertz, a frequency range more than three times higher than attainable with previously developed circuits. A Gigahertz is 1 billion cycles per second.

Attaining these higher frequencies is important because advanced communications satellites will operate at 20-30 Gigahertz and above. These frequencies will allow satellites to process data at much faster rates, resulting in a three-fold increase in the number of communications linkups they can handle.

"We believe this is a breakthrough in the application of high-temperature superconductors, a first in this field at Lewis, which will lead to major improvements in space and terrestrial communication systems," according to Dr. Stuart Fordyce, director for aerospace technology at Lewis.

The compactness and efficiency of the high-frequency circuit should reduce the size and mass of electronically aimed antennas at millimeter wavelengths, as well as increasing their pointing accuracy and tracking speed. Such antennas are desirable for future deep-space communications and remote sensing of the Earth's surface. The technology also may lead to dramatic improvements in terrestrial communications and data systems.

The Lewis team, led by Dr. Kul B. Bhasin, fabricated the circuit out of yttrium barium copper oxide, a material recently found to exhibit superconducting properties at higher temperatures than previously known materials.

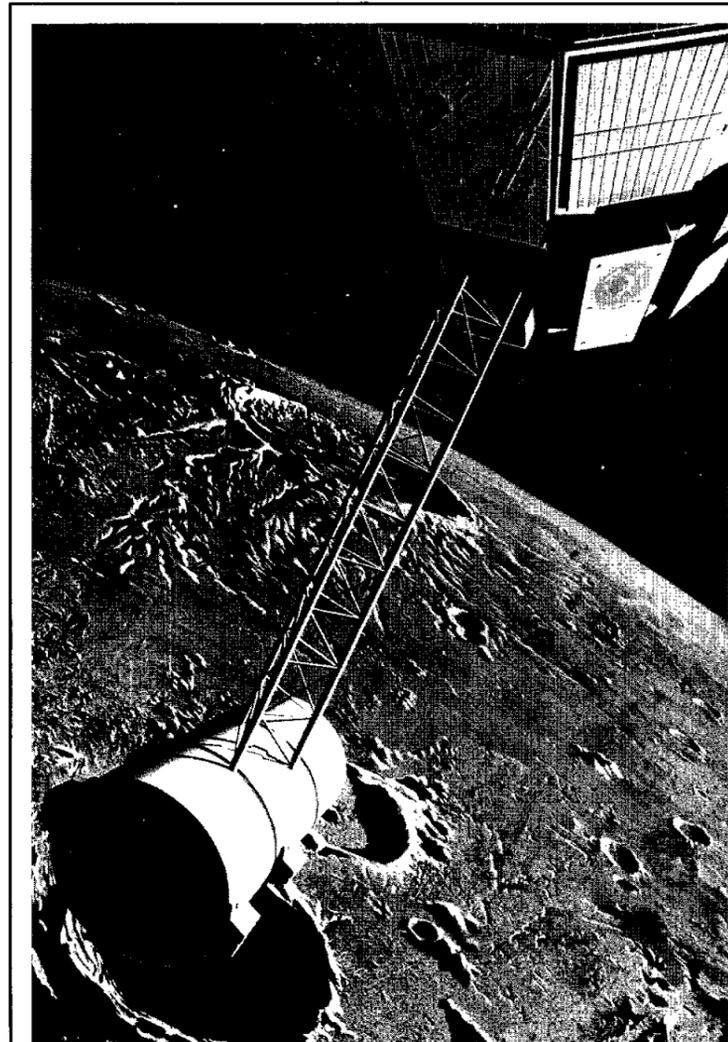
A laser beam vapor deposition technique developed by Joseph D. Warner was used to produce thin crystalline films of the superconducting material. The circuit then was constructed using integrated circuit fabrication techniques which the Lewis team adapted for use with the oxide superconductor.

Security seeks unused combination padlocks

A shortage of combination padlocks at JSC has led Security Operations Branch Chief Bob Gaffney to request the return of all such locks not being used at this time.

"There is a critical shortage of locks for use on the Center," said Gaffney, "and new locks cost \$42 each."

If Center employees have unused combination locks in their possession, Gaffney requests they be returned to Security's Dick McMinimy, in Room 211 B, Bldg. 45, or give him a call at x34037.



The proposed private Lunar Prospector probe would search for ice hidden in permanently shadowed areas of the Moon.

Lunar Prospector group seeks engineering help

A group of local engineers and scientists is looking for professional engineers to help them fly a low-cost private Lunar Prospector mission in 1991 or 1992.

The Lunar Prospector is seen as an inexpensive way to map lunar resources needed to support a lunar base and further space exploration. Cost of the 330-pound spin-stabilized satellite is estimated at less than \$5 million because of a reliance on contributions of time, equipment and material by individuals, organizations and companies.

Project Scientist Alan Binder and Project Engineer Preston Carter, both Lockheed Engineering and Science Co. employees at JSC, are working with the Space Studies

Institute (SSI) of Princeton, N.J.

Binder said a six-month design contract for the spacecraft will start in October, with construction expected to be complete by the summer of 1991. A donated launch is hoped for, he said.

Lunar Prospector would carry a gamma-ray/neutron spectrometer for global mapping of the lunar surface layer and searching for ice in permanently shadowed areas, an alpha particle spectrometer to map the distribution of radon gas release sites, a magnetometer/electron reflectometer to map magnetic fields, and a gravity experiment to map the lunar gravity field.

Anyone interested in volunteering should contact Binder at 283-5316, or Carter at 333-6755.

Task group effort under Craig involves two phases

(Continued from Page 1) of Mars and sending humans to the Red Planet.

"We'll take the information already presented to the Vice President and put more detail on it," Craig said. That will include technical descriptions of the necessary missions, discussions of ways to minimize risk, and definitions of the cost and impacts on Earth-orbit transportation and the space station.

The small task group will begin its work immediately and continue through October, Craig said. At first the effort will involve the 35 people already in Craig's organization. As the work continues, experts from

other JSC line organizations, NASA Headquarters and the other centers will join the effort.

Then in January, the larger group will begin putting more definition on the areas studied with a special eye toward putting out procurements for necessary vehicles and equipment, Craig said.

"We're ready from the standpoint of having done enough technical work to understand the scope of the project," Craig said. "We're ready from an organizational standpoint. We know what needs to be done and can put in place the teams both at JSC and around the agency to do it."

Key personnel changes within NASA announced

NASA Administrator Richard H. Truly announced a number of key personnel changes over the past few weeks, including the appointment of Bill Lenoir as acting associate administrator for space flight.

Lenoir, who already had been named associate administrator for space station, has been studying the possible merger of the two offices since he returned to NASA in May.

Truly announced July 25 that John E. O'Brien would return to NASA as assistant deputy administrator. In this position, O'Brien will support the agency's efforts to formulate plans to implement future goals in space as outlined by President Bush in his July 20 speech. Also, he will perform special analyses for the administrator and be involved in management problem solving.

O'Brien returns to NASA from the Washington law firm of Steptoe & Johnson where he specialized in defense and aerospace legal issues. He was NASA general counsel from August 1985 to July 1988.

Truly announced July 12 that Charles T. Force has been named

to succeed Robert O. Aller as head of the Office of Space Operations. Force had been deputy associate administrator for space tracking and data systems since 1986.

Aller left government service July 14, citing many disappointments in the treatment of government employees and vague new post-government employment regulations.

And, Truly appointed Dr. Dale L. Compton acting director of Ames Research Center on July 17, two days after Dr. William F. Ballhaus Jr., resigned. Compton has been Ames deputy director since 1985.

Ballhaus served as Ames director from January 1984 through January 1988 and from February 1989 until his departure. Ballhaus also served as acting associate administrator for aeronautics and space technology at NASA Headquarters from February 1988 through March 1989.

Ballhaus, too, cited inadequate compensation for senior federal executives and vague post-government employment regulations as factors in his decision.

Chantal spawns winds, rain

(Continued from Page 1) bright side, there were no reported injuries, and all JSC departments reportedly were able to begin operation Wednesday morning without delay," he said.

About 200 Pan Am employees and riggers, as well as approximately 20 Plant Engineering employees, were on site Tuesday to secure the center and cope with the immediate effects of the storm, according to McQuary.

"You know, it was almost dangerous to be out during that storm," McQuary said. "And these folks did an excellent job of preventing any more damage than there was." In coping with such conditions, McQuary points out JSC crews think safety first, when restoring power or coping with the effects. Bearing that in mind, all power was intentionally removed from the buildings in the 200 area to the north of the center.

"Secondly, we look at security considerations, and operational needs are looked at last," McQuary said. When cleaning up branches and tree limbs around the center, priority is given to clearing the streets first, then concentration on the parking lots, the lawns in the visitors area, and lawns in general. "We lost several trees," he said, "but things weren't nearly as bad as Alicia few years ago."

The storm also affected the various construction sites on the center, since, although employees returned to work on Wednesday, "it was still far too wet to work (at the sites)," according to McQuary. And crews were expected to continue working through Wednesday night, vacuuming wet carpets on the eighth and ninth floor of Bldg. 1, where leaks from the five-foot loggia ledges outside the windows brought some water onto every floor of the nine-story building.

Voyager 2 nears Neptune

(Continued from Page 1) Their temporary names designate the order in which they were discovered.

Like 1989 N1, discovered last month, the three new moons occupy nearly circular and equatorial orbits around the planet. All move in prograde orbits, making Triton even more of an oddity in the Neptune system.

The innermost of the new moons is 1989 N3, which orbits at a distance of about 32,300 miles from the center of the planet or about 17,000 miles from Neptune's cloud tops. It makes one complete orbit of Neptune every 8 hours, 10 minutes.

Next is 1989 N4, orbiting about 38,000 miles from the planet's center or about 23,300 miles from the cloud tops. It orbits the planet every 10 hours, 20 minutes.

The outermost is 1989 N2, orbiting at about 45,400 miles from Neptune's center or about 30,000 miles from the cloud tops. It completes an orbit every 13 hours, 30 minutes.

The three new moons exist in the region where partial Neptunian rings or "ring arcs" are thought to exist. If ring arcs exist, the new moons might play an important role in "shepherd-

ing" and maintaining them, Voyager scientists said. The search for moons and visible ring arcs will continue as Voyager 2 flies toward Neptune.

Several sequences of spacecraft activity include plans to point Voyager 2's cameras at any newly discovered ring arcs or moons. NASA Select will broadcast Voyager 2 press conferences daily from Aug. 21-29 at 8 a.m. JSC time, and there will be intermittent updates and visual coverage of the flybys throughout that time period.



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